Table 1.5			
Comparison of Hatfield Model versus BCM2 Washington State - US West Only Default Values			
	Hatfield Model	**BCM2**	**NECA[1]**
USF Requirement			$0
$20 Benchmark	$25,371,724	$130,636,290	
$30 Benchmark	$8,492,404	$40,469,315	
$40 Benchmark	$5,169,537	$17,504,985	
Average Cost	$17.51	$26.16	N/A
Households	1,350,151	1,229,210	
Lines	2,468,673	2,236,671	
[1] 1996 Projected Annual USF at 100% (Based on 1994 data).			

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	Table 1.6 Comparison of Hatfield Model versus BCM2 Washington State - All ILECs Default Values		
	Hatfield Model	**BCM2**	**NECA**[1]
USF Requirement			$15,853,445
$20 Benchmark	N/A	$279,458,563	
$30 Benchmark	N/A	$131,124,029	
$40 Benchmark	N/A	$76,625,614	
Average Cost	N/A	$29.41	N/A
Households	N/A	1,875,508	
Lines	N/A	3,293,923	
[1] 1996 Projected Annual USF at 100% (Based on 1994 data).			

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The Hatfield Model does not presently include non-BOC regions of the country

A fundamental difference between the BCM2 and the Hatfield Model is that, while the BCM2 includes data for all regions of the country, the Hatfield Model only includes data for those regions that are presently served by BOCs or by SNET, and thus presently excludes many areas that are presently considered to be high-cost areas. At one level, because a forward-looking model should be "company-neutral," it is immaterial which LEC is serving any given CBG or wire center, because the model is capturing hypothetical costs. For some purposes, so long as we are comparing the same regions of the country in our analysis, it does not matter that we are comparing a subset of the country. However, because the Hatfield Model does not yet include the entire country, a policy maker cannot yet readily use the Hatfield Model to gauge the size of the universal service fund.

In order to make comparable analyses, in our runs, we simply deleted the non-BOC CBGs from the BCM2 data set. Table 1.5, above provides these comparative results using the default values in each of the two models, i.e., it displays BCM2 and Hatfield Model results for Washington State for BOC-served CBGs only.

It is also helpful to obtain a sense of the "deleted" information. The following table provides some key indicators of the non-BOC territory.

Table 1.7 Hatfield Model vs. BCM2 Washington State			
	BCM2 unadjusted	**BCM2, BOC only**	**Hatfield Model**
Number of CBGs	4,618	2,936	2,902
Number of Wire Centers	358	113	112
Number of Households	1,875,805	1,229,210	1,350,151
Number of Lines	3,293,923	2,236,671	2,468,673
Sources: BCM2 and Hatfield Model input files for Washington State.			

Table 1.8						
Distribution of Households and Lines by Density Zone BCM2, BCM2 (BOC Only), and Hatfield Model						
	Density Zones					
	Less 5	5 to 200	200 to 650	650 to 850	850 to 2550	Greater 2550
Number of Households						
BCM2 unadjusted	19,098	408,954	266,499	101,986	681,340	397,991
BCM2, BOC only	3,120	159,225	166,157	65,488	483,909	351,311
Hatfield Model	9,048	131,613	126,085	49,354	390,228	643,823
Number of Lines						
BCM2 unadjusted	26,849	634,397	487,515	181,135	1,181,569	782,457
BCM2, BOC only	4,259	266,280	307,276	116,098	843,547	699,211
Hatfield Model	14,278	195,672	192,602	74,459	645,433	1,346,229

The Hatfield Model, by virtue of simply examining RBOC territory, under-represents the high-cost areas of the United States and thus one cannot simply "scale up" the results of the Hatfield Model in order to develop an estimate of the USF that would result from a full-run (i.e., including ICOs) of the Hatfield Model. Furthermore, by deleting the ICO areas from the BCM2 and then comparing these results with the Hatfield Model results, we are examining a disproportionate subset of the state, namely a set of households that are, on average, less likely to require high-cost support. However, a density-zone-based adjustment may yield some very approximate theoretical results. That is, one would take the percentages of households that receive assistance under the Hatfield Model for each of the density zones, and then apply those six factors to the total quantities of households for all territory (BOC and ICO). Such an extrapolation, however, will necessarily be a very rough indicator of the theoretical Hatfield Model USF because the density zone classification does not capture the many different cost drivers of basic local exchange service. Furthermore, as we demonstrate below, there is a similar, but not identical distribution of households, CBGs, and total lines within the two models.

According to the Sponsors of the Hatfield Model, it is not currently possible to run the model directly for the non-Tier 1 LECs.[13] (The Hatfield Model that has been filed with the FCC does not yet include data for all Tier 1 LECs.) The Sponsors attempted to apply cost relationships for each density zone that could then be applied to the Tier 2 LECs, and then, after applying adjustment factors, the Sponsors provided results "for illustrative purposes only."[14] Although the results are for illustrative purposes, they demonstrate the potential for the Hatfield Model to size universal service funding requirements in non-BOC regions.

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13. Supplemental Response at 2 (*op. cit.*, footnote 8).

14. Supplemental Response at 2-3, and Attachment 1 (*op. cit.*, footnote 8).

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Classification of regions of the country among the six density zones in the Hatfield Model and the BCM2

Each of the two models classifies CBGs among six density zones, which in turn affects the computation of network investment costs because the density classification is one of the determinants of network engineering assumptions (e.g., percentages of aerial and underground cable).[15] Although the density zone categories are the same, Table 1.9 shows that there is not a one-to-one correspondence between the two models. For example, in the Hatfield Model 11% of the CBGs are in the density zone of 5 to 200 lines per square mile, while in the BCM2, 16% of the CBGs are in this same density zone. This mismatch is one of several factors that explains the differing results of the BCM2 and the Hatfield Model.[16]

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15. A cursory comparison of the original BCM and the BCM2 results seems to suggest that the BCM2 shifts assistance from the most sparsely populated regions (density zone with fewer than 5 per square mile) to the second most sparsely populated regions (density zone 5 - 200 lines per square mile). A closer examination suggests simply that households have been reclassified into a higher density zone by virtue of including business lines. In other words, relative to the original BCM, the BCM2 does not shift support from one set of households to another, but rather shifts households from one density zone to another.

16. This mismatch, in turn, is explained, in part, by differing approaches to reflecting business lines in the density zone classification. A further explanation of differences between the Hatfield Model and BCM2 may be explained by the use of 1995 versus 1990 census data (i.e., 1995 data would reflect recent population growth in Washington State).

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Table 1.9											
Density Zone Classification (quantity of households, CBGs, and total lines)											
Washington State - BOC Only											
	Households				**CBGs**				**Total Lines**			
Density Zone	**Hatfield Model**		**BCM2**		**Hatfield Model**		**BCM2**		**Hatfield Model**		**BCM2**	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Less 5	9,048	1%	3,120	0%	36	1%	47	2%	14,278	1%	4,259	0%
5 to 200	131,613	10%	159,225	13%	326	11%	481	16%	195,672	8%	266,280	12%
200 to 650	126,085	9%	166,157	14%	251	9%	384	13%	192,602	8%	307,276	14%
650 to 850	49,354	4%	65,488	5%	94	3%	141	5%	74,459	3%	116,098	5%
850 to 2550	390,228	29%	483,909	39%	749	26%	1,139	39%	645,433	26%	843,547	38%
Greater 2550	643,823	48%	351,311	29%	1,446	50%	744	25%	1,346,229	55%	699,211	31%
Total	1,350,151		1,229,210		2,902		2,936		2,468,673		2,236,671	

Difference in scope of service being modelled

The Hatfield Model provides results for the following components of the network costs of basic local service:

- Loop

- Port

- End office usage

- Signaling

- Transport

- Billing/bill inquiries

- Directory listing

- local network portability expense (when available)

These results are provided for each of the six density zones, and then a weighted average (weighted by the number of households) is provided. The default results for the state of Washington are as follows:

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Table 1.10
Breakdown of Hatfield Model Default Results by Component **State of Washington**

Density Zone: Network Component	0-5	5-200	200-650	650-850	850-2550	> 2550	Weighted Average
Loop	$83.03	$26.84	$14.91	$12.47	$11.54	$9.59	$12.39
Port	$1.14	$1.14	$1.14	$1.14	$1.14	$1.14	$1.14
End office usage	$1.45	$1.45	$1.45	$1.45	$1.45	$1.45	$1.45
Signaling	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04	$0.04
Transport	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05
Billing/bill inquiries	$1.43	$1.43	$1.43	$1.43	$1.43	$1.43	$1.43
Directory listing	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18
LNP expense (when available)	$0.29	$0.29	$0.29	$0.29	$0.29	$0.29	$0.29
Total monthly cost/line	$87.61	$31.42	$19.49	$17.05	$16.12	$14.17	$17.51
Source: Hatfield Model, Version 2.2, Release 2, documentation accompanying September 10, 1996 letter of submission to FCC, Attachment 2, p. 92 of 98.							

By contrast, the scope of basic local exchange service that the BCM2 models does not explicitly include signalling, billing and bill inquiries, directory listing, and LNP expense.[17]

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17. Billing related expenses may be reflected in the non-plant-related expense factor in the BCM2.

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Table 1.11 Comparison of Scope of Basic Local Exchange Service		
Network Component	Hatfield Model	BCM2
Loop	✓	✓
Port	✓	✓
End office usage	✓	
Signaling	✓	
Transport	✓	✓
Billing/bill inquiries	✓	
Directory listing	✓	
Local number portability expense (when available)	✓	
Sources: Hatfield Model and Benchmark Cost Model 2 documentation and output files.		
Note: Some billing and directory related expenses may be reflected in the BCM2's non-plant-related expense factor.		

The default result for the cost of basic local exchange service in Washington yielded by the Hatfield Model, which excludes non-BOC companies, is $17.51. If billing, directory listings, and local number portability expense are excluded, this cost drops to $15.61. By comparison, the result for the default BCM2, modelling US West only, is $26.16 per month.

Basic comparisons

Input data

The Hatfield Model, the BCM, and the BCM2 all use census block group (CBG) records as their most fundamental input. In fact, the sponsors of the Hatfield Model refer to the input to the first module, the "Line Converter Module," as the "BCM-Plus Input Data," as it is nearly identical to the input to the *original* BCM. The CBG records contain geo-

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graphical and geological data that are used to build out the network from the actual locations of existing central offices as identified by the Local Exchange Routing Guide (LERG). Included in this data are measures for the CBG's depth and hardness of bedrock as well as a surface texture type. The input to the Line Converter Module of the Hatfield Model differs from the input to the original BCM in the following three ways:

1. The Hatfield Model only includes CBG records for the Regional Bell Holding Company (RBHC) that operates in each state. (Both the BCM and BCM2 included input data for all local exchange carriers operating in each state).

2. The number of households per CBG in the Hatfield Model has been updated to reflect 1995 census data. (Household counts in the BCM and the BCM2 are derived from 1990 census data).[18]

3. The developers of the Hatfield Model have included an estimate of business employees per CBG obtained from a November 1995 Dun and Bradstreet survey of the number of employees in each census tract, which is then translated into the quantity of business lines per CBG.[19] (The BCM2 also includes business line estimates.)

These three differences in input data are important as all three affect the number of lines that are modelled and thus the costs that are calculated by each model. The number of business lines, special access lines and public telephone lines in the Hatfield Model correspond to the number of lines for each category as reported by the state's Incumbent Local Exchange Carrier (ILEC) in ARMIS Form 43-08. These lines are allocated to individual CBGs on the basis of the number of employees per CBG. The BCM2 also includes business line estimates per CBG that were derived from a "third party database of employees by CBG."[20] However, the BCM2 did not actually include the number of employees per CBG in its input data nor did the Sponsors indicate the exact source of the employee per CBG database.[21]

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18. The BCM2's default residential line multiplier of 1.21 is based upon the ratio of all residential lines reported at the end of 1994 to 1990 households, which, thus, in part, must reflect some household growth (though, clearly not the households that are not connected to the public switched network).

19. See column O of the "Input" worksheet in the Line Converter Module.

20. Benchmark Cost Model: A Joint Submission by Sprint Corporation, US West, Inc. CC Docket No. 96-45, July 3, 1996 at 1 ("BCM2 Methodology").

21. Unlike the BCM2, the original BCM only accounted for the presence of business lines in the development of switching costs through a business line gross up factor of 1.75.

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The inclusion of additional lines other than primary residential access lines is crucial if a cost proxy model is to properly reflect the economies of scale and scope that arise from the provision of multiple services over a single integrated network.[22] (Inclusion of non-primary residential access lines is limited to the calculation of economies of scale and scope; that is, it would not be included when determining USF support.) Thus, a comparison of the total line estimates of the Hatfield Model with those of the BCM2 may indicate whether the number of lines represents a significant source of the variability in the cost estimates generated by the two models.

First, in order to provide an equal basis for comparison, we deleted the non-RBOC CBGs from the BCM2 data for Washington State so as to match the RBOC-only Washington State data of the Hatfield Model. This exercise revealed that in the case of Washington State, the Hatfield Model contains slightly fewer CBGs for Pacific Northwest Bell than does the BCM2. (See Table 1.12 below). Also, as mentioned above, the household estimates in the Hatfield Model have been updated to reflect 1995 census data while the BCM2 relies on household data from the 1990 census. Thus, not surprisingly, the Hatfield Model input data includes approximately 10% more households for Washington State than does the BCM2 RBOC-only input data for Washington State.

We then compared the number of residential access lines in both models, again using RBOC-only data for Washington State. The BCM2 and the Hatfield Model both account for the presence of additional residential access lines albeit through slightly different methods. The BCM2 calculates additional residential access lines through a user-adjustable "residential line multiplier." The BCM2's default residential line multiplier of 1.21 is based upon the ratio of all residential lines reported at the end of 1994 to 1990 households. The Hatfield Model does not utilize a user specified input for additional residential access lines but rather grosses up the number of residential access lines to match the total as reported by the incumbent LEC in ARMIS Form 43-08.[23] As shown below in Table 1.12, the Hatfield Model estimates slightly more residential access lines for Pacific Northwest Bell in Washington State than is produced by the default residential line multiplier in the BCM2.

Table 1.12 also shows the discrepancies in line counts for business lines, special access lines and public lines between the Hatfield Model and the BCM2. The BCM2 attributes approximately 20% more business lines to Pacific Northwest Bell than does the Hatfield Model. This relationship is reversed in the case of special access lines where the Hatfield Model includes roughly three times as many special access lines as does the BCM2. In the BCM2, the number of special access lines per CBG is derived from the CBG's number of

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22. As is discussed in greater detail in ETI's earlier reports (April Report at 89-107, and August Report at 105-132), additional revisions (other than the inclusion of non-primary lines) are required in order to reflect the economies of scale and scope applicable to sizing a universal service fund.

23. Model Description, Hatfield Model Version 2.2 Release 2, Hatfield Associates, Inc., September 4, 1996, Attachment 1, at 13 ("Hatfield Model Description").

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business lines through a user specified "Special Access Ratio." The default value for this ratio is 0.13, meaning that a CBG will have 0.13 special access lines per every business line. In the Hatfield Model, special access lines (as are business lines and public lines) are grossed up to within 0.5% of the totals as reported by ARMIS and are then attributed to individual CBGs according to the number of employees per CBG. As shown below in Table 1.12, the Hatfield Model includes over 18,000 public telephone lines for Pacific Northwest Bell while the BCM2 does not reflect the presence of public telephone lines at all. All else being equal, the inclusion of lines other than primary residential lines drives down the cost.

Table 1.12			
Line Counts by Category for Washington State			
	BCM2 unadjusted	**BCM2, BOC only**	**Hatfield Model**
CBGs	4,542	2,936	2,902
Wire Centers	358	113	112
Households	1,875,805	1,229,210	1,350,151
Residential Lines	2,269,364	1,487,344	1,528,643
Business Lines	1,030,185	753,015	628,306
Special Access Lines	133,924	97,892	292,983
Public Lines	N/A	N/A	18,741
Total Lines	3,293,923	2,338,251	2,468,673
Source: BCM2 and Hatfield Model input files for Washington State.			

The line total differences outlined in Table 1.12 represent only one "input-related" difference between the Hatfield Model and the BCM2, however there are certainly many more. As is discussed below, the Hatfield Model contains several user inputs that give the user greater control over such areas as the conversion of investment estimates into cost estimates and which develop costs for interoffice transport and other investments related to wire centers.

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Output/purpose of the models

The Hatfield Model and the BCM2 also produce slightly different outputs. The BCM2 was designed to "estimate a benchmark cost of providing basic local telephone service for both businesses and residence customers" and to use the average monthly statewide cost of service to estimate a universal service funding requirement under various price support thresholds.[24] The stated purposes of the Hatfield Model are to: 1) estimate the forward-looking economic cost of unbundled network elements based on TELRIC principles; and 2) to estimate the forward-looking economic cost of the basic local telephone service that is the target of universal service funding mechanisms.[25]

Comparing relative ease of use

Running time

Using the automated features of the models' respective graphical user interfaces, ETI conducted sample test runs to determine the approximate running times associated with BCM2 and Hatfield Model. Both models were run on an identically configured PC using default inputs. The BCM2 shows a greater variation in the amount of time it takes to compute results with run times roughly corresponding to the number of CBGs in a given state. For instance, the State of Washington, with more than 4,500 CBGs, takes approximately 20 minutes to run, while Delaware (only 519 CBGs) takes about 45 seconds.

The Hatfield Model is much slower, by comparison, particularly considering the fact that the model is calculating RBOC-only data and the fluctuation in run times for smaller versus larger states is lower. Using the same example, the State of Washington took approximately 45 minutes. Once a workfile for a state has been created, however, additional runs with modified inputs are often faster. This increase in speed depends upon the variable being adjusted. If, for instance, an adjustment is made to a variable which feeds into the Expense Module, then the time to re-process is greatly reduced because the interface only opens the Expense Module (the last module in the model's sequence) in order to recalculate. Of course, part of the increased overall processing time for the Hatfield Model is no doubt linked to its modular nature (a condition which existed in the original BCM, but which was improved — at least in terms of processing time — in the BCM2). If, however, use of the Hatfield Model develops costs that are significantly more accurate, then the additional running time required may, in fact, be justified.

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24. BCM2 Methodology, at 1.

25. Hatfield Model Description, at 1.

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Multi-state processing

Another limitation of the Hatfield Model relates to its inability to process more than one state at a time. While we have experienced some problems in conducting a national run using the multi-state processing feature in BCM2, it does, nevertheless, possess the capability. (We experienced some difficulties in running a large number of states at once in BCM2, but found that we could process about 8-10 randomly selected states at a time without experiencing any complications.) This is not an insignificant issue. The ability to perform runs with alternate input assumptions to validate or otherwise test the algorithms of a model can be a time consuming task. Given that such rigorous testing is needed, particularly in instances where the model's designers have failed to properly document an input assumption or key algorithm, a model which can facilitate testing by shortening the processing time has certain obvious advantages over slower models.

Ability to examine interim results in the Hatfield Model

This newest version of the Hatfield Model is macro driven such that all six modules are processed successively without the need for intervention by the user between modules. This feature of the Hatfield Model has both advantages and disadvantages. On the positive side, the model is fairly simple to operate and saves time by not requiring the user to manipulate interim results. However, not all of the worksheets in the individual modules are saved when the model is processed in the "macro" mode and this feature constrains the user's ability to perform certain analyses. For example, the saved results from the Hatfield Model do not include the entire "Main Logic Sheet" or "Costing" sheets of the "BCM-Plus Loop" Module. These worksheets are among the most important in the model as they develop and cost out most of the outside plant portion of the network. Included in the "Main Logic" sheet is a column which assigns either copper or fiber main feeder to each CBG. However, this particular column is not among those that are included in the saved output from the Hatfield Model in either the state specific workfile (i.e., "WA_wf.xls") or the expense file ("WA_exp820.xls"). Thus, it is not readily apparent, for example, whether a particular CBG was assigned copper or fiber main feeder. As a result, in order to identify the feeder technology assigned to each CBG, the user must manipulate multiple columns of data that are included in the saved output. These steps would not be necessary if each worksheet of each module was saved automatically. There are certainly other columns within the "BCM Plus Loop Module" and the other Hatfield modules which warrant detailed analysis but which are missing from the saved output when the Hatfield Model is processed automatically through the user interface. Thus the model's openness could be improved if all worksheets from the six modules were saved when the model is processed automatically.

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"Openness" of cost proxy models

The Hatfield Model, like the BCM2, "locks" cells in the algorithmic areas of several worksheets (e.g., the "Main Logic" worksheet of the BCM Plus Loop Module). This prevents users from adjusting attributes of the Hatfield Model such as the number of distribution legs assigned to each density zone. As we discussed in the August Report,[26] this locking of cells frustrates efforts at developing a comprehensive and objective analysis of the cost proxy model. There is no apparent reason for locking *any* cells of a *public* cost proxy model.

Level of geographic aggregation for sizing the USF

Neither the Hatfield Model nor the BCM2 readily permit the computation of the USF requirement based upon the wire center. However, it is possible to manually aggregate results to the wire center level in both models. In ETI's three previous reports, we discuss the methods used to compute USF support at this level using the BCM2.[27] In the New Jersey proceeding one of the Hatfield Model developers described how wire center results for New Jersey were calculated:

> "The CBG database includes the assignment of each CBG to a wire center. We can thus readily determine the set of CBGs that are served by each BA-NJ wire center. Since we also know the number of households in, and the line density of, each CBG, it is possible to determine the density zone constituency of the wire center — that is, the number of households served by the wire center that belong to each of the six density zones. With this information, and the monthly cost per line for each density zone we are able to calculate an average monthly cost per line for the entire wire center, weighted according to the relative number of households in each of the density zones present in the wire center."[28]

This inability to *automatically* compute wire center level USF support is a shortcoming of both models. The USF should be computed at the wire center in order to reflect the economies of scale and scope that ILECs enjoy. Discussion of this point can be found in our previous reports.[29]

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26. August Report at 29.

27. See April Report, pp. 93-100, May Report, pp. 18-21, and August Report, pp. 109-115.

28. Direct Testimony of Robert A. Mercer on behalf of AT&T Communications of New Jersey, Inc. and MCI Telecommunications Corporation, Docket No. TX95120631, August 15, 1996, p. 27 (Public Version).

29. *Op. cit.*, footnote 27.

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Economies of scale and scope

Neither the Hatfield Model nor the BCM2 fully reflects economies of scope and scale. As is discussed in greater detail in ETI's earlier reports[30], additional revisions (other than the inclusion of non-primary lines) are required in order to reflect the economies of scale and scope applicable to sizing a universal service fund.

We have demonstrated that it is technically feasible to perform such calculations using the BCM2. While we have not undertaken further analysis of this issue for this report, it nevertheless merits further analysis, particularly regarding its applicability to the Hatfield Model.

User inputs that are unique to Hatfield Model

The Hatfield Model has user adjustable inputs in a number of areas that are not available in BCM2. In certain instances, this occurs because the Hatfield Model includes some additional investments that are either not modelled or else not treated separately in BCM2, including, for example, particular signalling and wire center investments. The Hatfield Model has user inputs for Signalling Parameters and Wire Center Parameters that simply do not exist in the BCM2. See Table 1.13 for Signalling Parameters and see Chapter 3 for details regarding the wire center parameters.

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30. See April Report at 89-107 and August Report at 105-132.

Table 1.13 Signalling Parameters	
Input Name	**Default Value**
STP Link Capacity	720
STP Maximum Fill	0.8
STP Investment, per pair, fully equipped	$5,000,000
STP Common equipment Investment, per pair	$1,000,000
Link Termination, both ends	$900
Signaling Link Bit Rate	56,000
Link Occupancy	0.4
C Link Cross-Section	24
ISUP messages per interoffice BHCA	6
ISUP message length, bytes	25
TCAP messages per transaction	2
TCAP message length, bytes	100
Fraction of BHCA requiring TCAP	0.1
SCP investment per transaction per second	$20,000
Source: Hatfield Model user inputs worksheet.	

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2 | AN ASSESSMENT OF THE HATFIELD MODEL COST FACTOR

The major components of a cost factor, or carrying charge (which translates investment into a monthly cost)[31] are:

- Capital structure;
- Depreciation expenses; and
- Non-plant-related expenses, or overhead.[32]

Capital structure

The components of the capital structure (i.e., debt/equity ratio, and cost of debt and equity) can be easily changed in the Hatfield Model, whereas a user of the BCM2 seeking to change the implied capital structure would need to perform calculations external to the model and derive alternative investment factors.

We analyzed two different aspects of the capital structure in the Hatfield Model:

1. We tested the significance of using the BCM2 rate of return (11.25%) instead of the Hatfield default value of 10.01%.

2. Consistent with ETI's recommendations in our April Report,[33] we developed an approach for regulators to compute an alternative rate of return that could be used in a national cost proxy model for USF funding. One question is whether a single,

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31. This topic is also discussed in the fourth chapter of ETI's April Report and the third chapter of ETI's August Report.

32. Table 2.9 at the end of this chapter provides a detailed comparison of the cost factors and inputs of the BCM2 and Hatfield Model.

33. April Report at 69.

uniform national number should be used or whether state-specific capital structures should be incorporated in runs of a cost proxy model. Assuming recent data exists (i.e., recently approved capital structures), we recommend the use of data specific to the relevant jurisdiction. A default capital structure could be used where such data are unavailable.

We have computed an illustrative default capital structure. As we discussed in our April Report, a reasonable approach to computing a rate of return for a forward-looking cost proxy model would be to assign a 25% weight to the authorized interstate rate of return and a 75% weight to a representative authorized intrastate rate of return. In order to compute a "representative" intrastate capital structure, we examined several PUC decisions issued within the last few years — clearly a larger sample would yield a more representative result. Indeed, because one can separately specify the capital structure for each state in the Hatfield Model, we recommend that the state-appropriate capital structure be used. The following analysis and computations are simply to provide an illustrative "national" number.

Analysis conducted:

- First, to conduct an "apples-to-apples" comparison, we replaced the default capital structure in the Hatfield Model (which yields a rate of return of 10.01%) with one that yields the BCM2's default rate of return of 11.25%. Table 2.1 below shows that this change, made in isolation, causes the average cost to increase by $0.85, and the USF (at $30) to increase by 34%.

Table 2.1 Impact of Running the Hatfield Model with the BCM2 ROR Washington		
USF Requirement	**Default ROR**	**ROR at 11.25%**
$20 Benchmark	$25,371,724	$28,815,458
$30 Benchmark	8,492,404	11,408,340
$40 Benchmark	5,169,537	5,676,247
Average Cost	$17.51	$18.36

- Second, as we stated in the April Report,[34] it is inappropriate to use an interstate rate of return when computing an *unseparated* cost. Table 2.2 below provides a summary of several recent state PUC decisions, which is intended to be illustrative, not comprehensive. Taking a weighted average (using access lines as the unit for weight) of the rates of return approved in the District of Columbia, Vermont and Washington, yields a state-approved rate of return of 9.41%.[35] We then afforded this number a 75% weight and afforded the interstate rate of return of 11.25% a weight of 25% to yield an overall rate of return of 9.87%. We do not contend that this is the "accurate" alternative number but do contend that it is far more representative of regulatory decisions than the default number used in the BCM2.

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34. April Report at 69.

35. The California PUC rate of return was not included in the calculations because no breakdown into debt and equity components was provided.

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Table 2.2			
Illustrative Capital Structures			
	Ratios	**Cost Rates**	**Weighted Costs**
California			**10.00%**
District of Columbia			
C&P Long Term Debt	41.90%	8.16%	3.42%
Bell Atlantic Origin Debt	11.60%	8.16%	0.95%
Common Equity	46.50%	11.45%	5.32%
TOTAL	100.00%		**9.69%**
Vermont			
Common Equity	50.00%	11.00%	5.50%
Short-term Debt	1.96%	4.00%	0.08%
Long-Term Debt	38.98%	7.50%	2.92%
Deferred Income Taxes	9.06%	0.00%	0.00%
TOTAL	100.00%		**8.50%**
Washington			
Long-Term Debt	38.90%	7.57%	2.94%
Short-Term Debt	9.10%	6.00%	0.55%
Preferred Equity	0.00%	0.00%	0.00%
Common Equity	52.00%	11.30%	5.88%
TOTAL	100.00%		**9.37%**
FCC Authorized Return			
Debt	44.20%	8.80%	3.89%
Equity	55.80%	13.19%	7.36%
TOTAL	100.00%		**11.25%**

Sources: California PUC Decision No. 94-06-011, June 8, 1994; District of Columbia PSC Formal Case No. 926, Order No. 10353, December 21, 1993; Vermont PSB Docket No. 5700/5702, February 6, 1995; Washington UTC Docket No. UT-95-0200, April 11, 1996; 1990 Represcription Order, CC Docket No. 89-624.

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Recommendations and findings

- From an operational point of view, the Hatfield Model's feature that allows user-specified percentages and costs of debt and equity provides a more useful policy-making tool than the BCM2 which "hardwires" this value into the three investment factors.

- From a policy perspective, the BCM2's default value should be rejected because it fails to reflect state PUC decisions, and thus overstates the cost of basic local exchange service.

Depreciation

Background:

- As is discussed in ETI's April Report,[36] depreciation expenses account for a substantial percentage of the plant-related expenses, and thus the lives of the various . plant accounts that are either explicitly (as in the Hatfield Model) or implicitly (as in the BCM2) incorporated in a cost proxy model will directly affect the results of the universal service funding calculations. It is entirely inappropriate for depreciation expenses that are incorporated in a universal service cost proxy model to serve as a way to cross-subsidize ILECs' pursuit of competitive services.

- The Hatfield Model allows the user to specify depreciation lives for thirteen different categories of plant established by the Hatfield Model Sponsors. These categories generally correspond with ARMIS 43-03 accounts, though in some instances they include more than one account. The default values range from a low of 7.1 years for a category entitled "General Support" and a high of 37.0 years for a category entitled "Wire Center." The Hatfield Model Sponsors do not provide any justification for the default depreciation lives.

- By contrast, depreciation rates are "hard-wired" in the BCM2 in that they cannot be directly changed by the user.[37] The BCM2 Sponsors contend they use depreci-

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36. April Report at 67.

37. One would need to develop alternative cost factors to replace the three investment-related factors that are applied to the three categories of plant (cable and wire investment, circuit switch investment and switching equipment investment) that reflected alternative depreciation rates.

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ation lives that have been approved by regulators.[38] However, it is unclear whether these lives reflect both federal and state decisions, and if so, how the decisions are weighted, given that the cost results are expressed on an unseparated basis. For the purposes of our analysis, we have assumed that the depreciation rates reflected in the BCM2 correspond with those approved by the FCC in 1995.

• Table 2.3 below compares the plant lives in the Hatfield Model with those we assume to be used in the BCM2 for the state of Utah, which was chosen due to the availability of current depreciation data. In many instances, the lives in the BCM2 are longer than those in the Hatfield Model, which, all else being equal, would cause the cost of basic local exchange service that is computed by the BCM2 to be lower than that computed by the Hatfield Model.[39]

38. Benchmark Cost Model 2 Methodology at 18.

39. This comparison relies on Utah data. Unlike in the Hatfield Model, the BCM2 uses uniform national investment factors, and, therefore, regulators should seek information from the BCM2 sponsors that would permit a comparison of the implied national depreciation lives in the BCM2 with the depreciation lives in the Hatfield Model.

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Table 2.3			
Economic Life Comparisons			
Plant Category	**ARMIS 43-04 Accounts**	**Hatfield 2.2.2**	**BCM2[1] Utah**
Loop Distribution	2421, 2422, 2423 metallic	20.2	26.0
Loop Feeder	2421, 2422, 2423 combo metallic & fiber	20.1	26.0
Loop Concentrator	2232	10.4	11.0
End Office Switching	2212	14.3	16.0
Wire Center	2121	37.0	42.0
Tandem Switching	2212	14.3	16.0
OS Investment	2220	8.0	8.0
Transport Facilities	2421, 2422, 2423, 2426 fiber	19.0	26.0
STP	2212	14.3	16.0
SCP	2212	14.3	16.0
Links	2421, 2422, 2423, 2426 fiber	19.0.	26.0
Public Telephones	2351	9.2	7.0
General Support	2112, 2115,2116, 2122, 2123, 2124	7.1	6.6
Note: [1] BCM2 depreciation lives are assumed to be 1995 FCC approved lives for Utah			

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